Tanta University

Department: Electronics and Electrical Communications

Faculty of Engineering

Total Marks: (75) Marks

Course Title: Microprocessor Applications in Communication System | Course Code: EEC 3215

Year: 2016/2017 | Allowed time: 3 Hrs. | Date: 4 /6/2017 | No. of Pages: (3)

Question No. 1 :

Choose the correct answer to complete the sentence: **(5 Marks: 0.5 mark for each item)**

A. 8086 microprocessor uses a 20-bit address to access memory, so it can address up to ..... of memory space.
   a. 1 megabytes
   b. 64 kilobytes
   c. 2 gigabytes
   d. 3 megabytes

B. Various conditions of the results of ALU are stored in the.....
   a. segment registers
   b. general purpose registers
   c. flag register
   d. temporary registers

C. In most modern CPUs the instruction cycles are executed concurrently, and often in parallel, through a/an.....
   a. instruction pipeline
   b. register array
   c. timing and control unit
   d. PC/ IP

D. .....holds the address of a block of memory for reading from or writing to.
   a. Destination index register
   b. Memory data register (MDR)
   c. Base address register
   d. Memory address register (MAR)

E. Bus Interface Unit (BIU) contains.....
   a. instruction queue
   b. address adder
   c. accumulator register
   d. both a and b

F. Execution Unit (EU) contains.....
   a. instruction decoder
   b. code segment register
   c. instruction pointer
   d. both a and b

G. Instruction queue consists of.....
   a. 1-byte
   b. 2-byte
   c. 8-byte
   d. 6-byte

H. In 8086 microprocessors, there are..... segment registers.
   a. four 16-bit
   b. eight 16-bit
   c. four 32-bit
   d. eight 16-bit

I. .....is a register in which intermediate arithmetic and logic results are stored.
   a. Accumulator register
   b. Base register
   c. Source index
   d. Data register

J. ..... is the only general purpose register whose contents can be used for addressing the 8086 memory.
   a. Stack pointer
   b. Base register
   c. Data register
   d. Counter register

Question No. 2:

Complete the following sentences: **(5 Marks: 0.5 mark for each item)**

A. ..... connects all the internal components of a computer, such as CPU and memory, to the motherboard.

B. ....., controls the flow of information through the processor, and coordinates the activities of the other units within it.

C. The .....cycle takes the instruction required from memory and stores it in the instruction register.

D. ..... decodes instructions; sends information to the timing and control unit.

E. The stack segment is used as a stack and it is used to store.....

F. .....its content is automatically incremented as the execution of the next instruction takes place.

G. The index registers (SI & DI) and the BX generally default to .....

H. If ..... flag is set, the processor enters the single step execution mode by generating internal interrupts after the execution of each instruction.

I. The different ways in which a processor can access data are called .....

J. In 8086 assembly language, format of MOV instruction is.....

Question No.3: **(35 Mark: 5 marks for each item)**

A. Draw a block diagram that indicate a summary of registers & pipeline of 8086 microprocessors.

B. Describe the content of the flag register (CF, PF, AF, ZF, SF, OF), if the register AH = 8Bh and the instruction ADD AH, 3 is executed.

C. Determine the addressing mode for each of the following instructions and explain it with drawing:

a. MOV [8088], DL
b. MOV AX, DS: [1235]
c. MOV AL, [BP]
d. MOV AL, [BP+SI]
e. MOV AX, 345Fh

D. Differentiate between:

a. Program visible registers and program invisible registers.
b. AX, EAX, and RAX.
c. Real mode and protected mode memory addressing.

E. What are the three main parts of the 80286 through Core2 64-bit descriptors? What is the function of each part?

F. Describe the contents of a segment register during protected mode operation of the 80286 through Core2 microprocessors.

G. 80386 transforms logical addresses into physical address in two steps: segment translation and page translation. Draw only the block diagrams that describe these two steps.

Question No.4: **(15 Mark: 5 marks for each item)**

A. Write the VHDL code for 8-to-3 high priority encoder with active high enable.

B. Mention the different steps to accomplish a digital circuit design using VHDL.

C. Write A VHDL code for a circuit which converts a binary code to Gray code. the circuit has 4-bits input and output.

Question No.5: **(15 Mark: 7.5 mark for each item)**

A. Write A VHDL code which describes a comparator circuit: the circuit compares two binary numbers each number contains from 4-bits and the output are greater, less or equal.

B. Write A VHDL code for a circuit which add two binary numbers each number contains from 3-bits.

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End of Questions

Best wishes of success

Dr. Roayat Ismail
Dr. Hossam Kaseem

Tanta University

Department: Electronics & Comm. Eng.
Total Marks: 85 Marks

Faculty of Engineering

Course Title: Acoustic and Ultrasonic	Course Code: EEC3221	3rd Year
Date: 11-6-2017	Allowed time: 3 hrs	No. of Pages: (2)

Answer all the following questions:

Question 1 (20 mark)

1. Explain the principle of shock waves and beats.
2. Write an expression that describes the pressure variations as a function of position and time for a sinusoidal sound wave in air, if λ =0.2 m and S_{max}= 2 μm (given ρ=1.2 kg/m^3, v=343 m/s).
3. A plane acoustic wave is propagating in a medium of density ρ=1000 kg/m^3. The equation for a particle displacement in the medium due to the wave is given as

$$s = (1x10^{-6})\cos(8\pi x - 12000\pi t),$$

Determine the following:

a. The frequency and the wavelength of the sound wave?
b. The speed of sound in the medium?
c. The value of maximum acoustic pressure?
d. The bulk modulus of the medium?
e. The acoustic intensity of the sound wave?

4. A sound source emits a sound frequency of 1000 Hz on a day when the speed of sound in air is 340 m/s and there is no wind. What is the frequency you will receive if:
   a. You move toward the source at 34 m/s?
   b. You are stationary and the source moves towards you at 34 m/s?
   c. Repeat part a) with a speed of 68 m/s instead of 34 m/s.
   d. Repeat part b) with a speed of 68 m/s instead of 34 m/s

Question 2 (20 mark)

1. What is the reverberation time and the factors that affected on it?
2. The intensity of a sound wave at a fixed distance from a speaker vibrating at 2kHz is 0.6w/m2.
   a. Determine the intensity if the frequency is increased to 2.5 kHz while a constant displacement amplitude is maintained.
   b. Calculate the intensity if the frequency is reduced to 0.5 kHz and the displacement amplitude is doubled.

3. Explain how you can measure the reflection coefficient and the absorption coefficient of sound wave.

Question 3 (25 mark)

1. Explain the effect of the wavelength of an obstacle on the diffraction of sound wave.
2. What is the sound field diffusion?
3. Find the relation between *rms* of sound pressure p_{diff} and the intensity.
4. Consider a classroom with the following properties:

   Dimensions: 5m x 8m x 2.5m.
   Materials: laminate flooring, plastered walls and suspended ceiling.
   Calculate RT for this classroom at 500 Hz and 1000 Hz, where the absorption coefficients are given in the Table.

Material	125 Hz	250 Hz	500 Hz	1000 Hz
Plaster board	0.03	0.03	0.02	0.04
Laminate flooring	0.15	0.1	0.1	0.1
Thin carpet	0.1	0.15	0.25	0.3
Thick carpet	0.2	0.25	0.35	0.4
Suspended ceiling	0.1	0.25	0.70	0.85
Wall panel (board)	0.3	0.3	0.35	0.4

Question 4 (20 mark)

1. Compare between an electrostatic loudspeaker and the Ribbon loudspeaker in terms of structure, principle of operation and advantages and disadvantages of each type.
2. Differentiate with the aid of sketches between the Condenser, and Ribbon microphones. Which one has more sensitivity than the others?
3. Define the Directivity of the microphone.
4. State the types of the directivity patterns and the variations between them.

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GOOD LUCK

Course Coordinator:
DR. ENTESSAR SAEED

Course Title: Digital Comm. Systems	Course Code: EEC 3220	Year: 3rd
Date: Second Term 8/6/2017	Allowed Time: 3 Hours	No. of Pages: (2)

Answer the following Questions

Question 1: [18 Degrees]

a. Write-down and explain the meaning of Binomial distribution? Then indicate some of its applications. [3 Marks]

b. Define the result and the meaning of each function of the following: [3 Marks]

$$P(X \le x)$$

$$P(X = x)$$

$$\frac{d}{dx}[F_X(x)]$$

$$\frac{1}{\sqrt{2\pi\sigma^2}}\, e^{\frac{(x-m)^2}{2\sigma^2}}$$

$$\frac{2}{\sqrt{\pi}}\int_0^u e^{-u^2}\, du$$

$$\int_{-\infty}^{\infty} x\, f(x)\, dx$$

$$\int_{-\infty}^{\infty} g(x)\, f(x) dx$$

$$E[(X-m)^2]$$

$$E[X^n]$$

c. If $g(x)$ is a linear function given as: $Y = a\,X + b$, show how to estimate the probability density function of Y in terms of the probability density of X. [4 Marks]

d. A random process $X(t)$ is said to be stationary in the strict sense or stationary in the wide sense. Comment on the difference between them. What do you know about the Ergodic Process? [4 Marks]

e. Suppose white Gaussian noise of zero mean and $N_0/2$ power spectral density is applied to an ideal low-pass filter of bandwidth B. Estimate and draw the power spectral density of noise at the filter output in addition to its autocorrelation function. [4 Marks]

Question 2: [18 Degrees]

a. Explain the sample and hold concept, then show its advantage and drawback. [4 Marks]

b. Explain the Granular noise, how to reduce it and why it has been denoted as noise. [4 Marks]

c. Estimate the transmission data rate of T1 standard PCM system used in United States, Canada and Japan. Then draw and estimate the number of channels and the data rate for long haul T2, T3, and T4. [5 Marks]

d. Explain in brief the difference between crosstalk and intersymbol interference "ISI". Then show how to reduce ISI in practice. [5 Marks]

Question 3: [18 Degrees]

a. Explain the difference between the synchronous and asynchronous system concerning the digital transmission, giving an example for each. [5 Marks]

b. Illustrate what is meant by information capacity, then indicate why Shannon's limit is often misunderstood. [4 Marks]

c. Explain the offset QPSK system indicating its properties as compared to the usual one, then clarify its offset delay concept. [4 Marks]

d. Explain in details the operation of 2 to 4 converter in the transmitter of 8PSK. [5 Marks]

Question 4: [18 Degrees]

a. Draw and illustrate the analysis of the re-modulator loop carrier recovery circuit. [5 Marks]

b. Explain in details the modulation plan of typical FDMA system termed as FDM/FM/FDMA. [5 Marks]

c. Draw the demand assignment information flow, then illustrate its operation. [4 Marks]

d. Define the Poisson process, then show how to use it to estimate only the probability of success of ALOHA scheme indicating its collision space. [4 Marks]

Question 5: [18 Degrees]

a. Explain in details the operation of reservation ALOHA. [5 Marks]

b. Draw the frequency allocation of SPADE, then explain its operation. [5 Marks]

c. Draw and illustrate the Ethernet bit field specification. [4 Marks]

d. Explain in details the operation of Token ring scheme. [4 Marks]

With best wishes

Course Examination Committee

Assoc. Prof. Mahmoud Ahmed Attia Ali

Dr. Amr Hussain Hussain Abdallah

Dr. Heba El Kkoppy

Dr. Intisar Saeid Gameey

Course Coordinator:

Assistant Prof. Mahmoud Ahmed Attia Ali

Tanta University

Department: Electronics & Communications Engineering
Programme: Undergraduate
Total Marks: (75) Marks

Faculty of Engineering

Course Title: Optical Communications	Course Code: EEC3213	Year: 3rd year
Date: 15/06/2017	Allowed time: 3 hrs.	No. of Pages: (2)

Remarks: (answer all the following questions… assume any missing data… arrange your answer booklet)
You may use: $c = 3 \times 10^8$ m/s, $h = 6.625 \times 10^{-34}$ J.s , $q = 1.6 \times 10^{-19}$ C, $\epsilon_0 = 8.8542 \times 10^{-12}$F/m

Question No. 1 : (10) Marks

a) Prove that the power coupled into a step-index fiber from an LED with radius r_s that has a radiant distribution given by: $B(\theta) = B_0 \cos^3\theta$ is

$$P_F = \frac{\pi^2}{2} r_s^2 B_0 (2NA^2 - NA^4)$$

where NA is the step-index fiber numerical aperture.
(*Hint: you may use* $d(\sin\theta) = \cos\theta d\theta$ and $\sin^2\theta + \cos^2\theta = 1$) [5 Marks]

b) Explain (briefly aided with a formula and a sketch) how equilibrium numerical aperture results in extra power loss during coupling to a multimode fiber. [3 Marks]

c) Mention (only) two possible lensing schemes for coupling improvement. [2 Marks]

Question No. 2 : (16) Marks

a) Explain (briefly), aided with the physical structure and field distribution, the priciple of operation of Avalanche photodiode (APD). [5 Marks]

b) Suppose that a silicon pin photodiode has a depletion layer width $w = 20\ \mu m$, an area $A = 0.05$ mm^2, and a dielectric constant $K_s = 11.7$. If the photodiode is to operate with a 10 $K\Omega$ load resistor at 800 nm, where absorption coefficient $\alpha_s = 10^{-3}$ cm^{-1} and the drift speed is limited to the hole speed of 4.4×10^6 cm/s. [5 Marks]
   i. Compare the RC time constant and the carrier drift time of the device.
   ii. Is diffusion time of importance in this photodiode? Vaidate your result !

c) Define **breifly** (aided with formula if possible) the following terms: [6 Marks]
   i. Quantum efficiency (η).
   ii. Responsitivity ($\Re$).
   iii. Ionization rate (α *and* β).

Question No. 3 : (25) Marks

a) Discuss the five factors affecting the selection of detector during designing an optical link. [5 Marks]

b) Calculate the maximum attenuation-limited transmission distance of the following two systems operating at 100 Mbps. [6 Marks]

System (1) operating at 850 nm	System (2) operating at 1300 nm
(a) GaAlAs laser diode: 1mW fiber coupled power.	(a) InGaAsP LED: -13 dBm fiber coupled power.
(b) Silicon APD: -50 dBm sensitivity.	(b) InGaAs pin photodiode: -38 dBm sensitivity
(c) Graded-index fiber: 3.5 dB/Km attenuation	(c) Graded-index fiber: 1.5 dB/Km attenuation
(d) Connector loss: 1 dB/connector	(d) Connector loss: 1 dB/connector

[Assume a 6-dB system operating margin in each case.]

c) A 90-Mbps NRZ transmission system sends data using a GaAlAs laser diode that has a 1-nm spectral width. The rise time of the transmitter output is 2-ns. The transmission distance is 7 Km over a graded-index fiber that has an 800-MHz.Km bandwidth-distance product. The dispersion parameter D is about 0.07 ns/(nm.km). The receiver bandwidth is 90 MHz and the mode mixing factor $q = 0.7$. [6 Marks]

i. Determine the system rise time.
ii. Does this rise time meet the NRZ data requirement? Validate your answer!
iii. Determine the system rise time if there is no mode mixing in the 7-Km link.

d) Consider a commercially available 32 × 32 single mode coupler made from a cascade of 3-dB fused-fiber 2 × 2 couplers, where 5% of the power is lost in each element. [8 Marks]

i. What are the <u>two</u> basic roles of any generic N × N star coupler?
ii. How many 3-dB couplers are needed to construct this 32 × 32 coupler? (also indicate the number of elements in both <u>horizontal</u> and <u>vertical</u> directions).
iii. Determine the excess loss of this coupler.
iv. Determine the splitting loss of this coupler.
v. Determine the total loss of this coupler.

<u>Question No. 4</u> : (24) Marks

a) Sketch the basic block diagram of a typical WDM network, then, discuss **briefly** <u>three</u> features/advantages of WDM systems. [6 Marks]

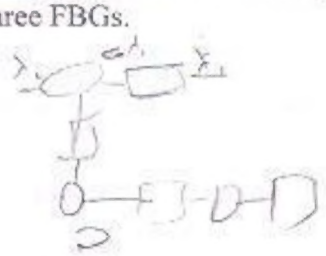
b) Prove that the propagation matrix of Mach-Zehnder Interferometer (MZI) is given by [6 Marks]

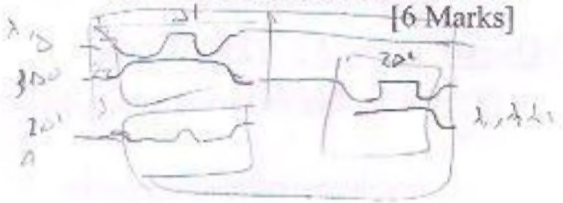
$$M = j\begin{bmatrix} \sin\frac{k\Delta L}{2} & \cos\frac{k\Delta L}{2} \\ \cos\frac{k\Delta L}{2} & -\sin\frac{k\Delta L}{2} \end{bmatrix}$$

Such that $k = \frac{2\pi n_{eff}}{\lambda}$ and ΔL is the path-length difference of the interferometer.

c) Sketch (only) the block diagram of a 4 × 4 MZI using a number of 2 × 2 MZI elements indicating the path length difference ΔL of each 2 × 2 MZI used in terms of the effective refractive index n_{eff} and the frequency separation $\Delta\nu$. [6 Marks]

d) <u>Using a sketch only</u>, explain how to multiplex four signals $\lambda_1, \lambda_2, \lambda_3, \lambda_4$ using three circuators and three FBGs. [6 Marks]





Good luck
Dr. Mahmoud Selim (Coordinator of the Course)

Tanta University | Department: Electronics & Electrical Communications | Faculty of Engineering

Total Marks: (70) Marks

Course Title: TV Engineering: (EEC613) | Final Exam. | 2nd Term: 2016/2017

Date: 18/ 06/ 2017 | Allowed time: (3) hrs. | No. of Pages: (1- two faces)

Part A: (35 Marks)

Answer the following questions

Question No. 1 : (12M)

a) - Sketch a simplified block diagram of basic monochrome television transmitter.

b)- Describe the basic principle of basic monochrome and colour TV receiver, and hence, draw the signal transmission paths in each case.

Question No.2: (12 M)

a)- State the basic factors with which TV system must deal for successful transmission and reception of pictures

b)- Why is a portion of the lower sideband of the AM picture signal transmitted along with the carrier and full USB ? Does it need any correction somewhere in the television link ? If so where is it carried out ?

Question No.3 (11 M)

a)- In (HDTV) with 2 megapixels (2Mpx) and 32 inch screen. Each pixel component is quantized to 8 bits, calculate the following:

i- Sampling density (Resolution). ii- Total data rate

b)- Draw the main block diagram of the Modern "HD-TV, and hence explain the function of display electronics related to the display type (e.g. LCD panel)

---------- Good Luck ----------

Prof. Mohamed El-Said Nasr

Part B: *(35 Marks)*

Answer the following questions

Question No. 4 : *(12M)*

a) *Define the image enhancement process.*

b) *Compare between the point and neighbourhood processing.*

c) *Mention with explanation the main image enhancement techniques.*

d) *Explain the concept of image histogram, and histogram equalisation with drawing.*

Question No.5: *(12 M)*

a) *Derive the design of the Laplacian filter.*

b) *Define the concept of digital image, feature extraction process and pattern classification*

c) *Explain the image processing systems' levels with drawing the stages in digital image processing system.*

Question No.6: *(11 M)*

a) *Define the segmentation process with addressing the four main segmentation techniques.*

b) *Local and global thresholding. Write the basic global thresholding algorithm.*

c) *Compare between the video and images concepts.*

---------- ***Good Luck*** ----------

Dr. Amira Ashour

Electronics and Electrical Comm. Dept.
Total Marks: 85 Marks

Course Title: **Electromagnetic Waves (2)**	Course Code: EEC 3214	Year: 3rd
Date: Sept., 22-6-2017	Allowed Time: 3 Hours	No. of Pages: (2)

Answer the following questions:

Question (1) [17 Marks]

a) **Explain** the following terms with **equations** and **drawing**:
1. Average radiated power density.
2. Radiation resistance.
3. Antenna radiation intensity.
4. Antenna directivity.
5. Antenna effective length.
6. Antenna effective area.
7. Advantages of antenna arrays over single antenna element.

b) **Prove** that the magnetic potential vector $A(r)$ is given by

$$A(r) = \frac{\mu}{4\pi}\iiint J(r')\left(\frac{e^{-j\beta R}}{R}\right) \quad dv$$

Question (2) [17 Marks]

a) For infinitesimal dipole antenna, **prove** that the magnetic potential A_z is given by

$$A_z = \frac{\mu}{4\pi} I_0 \Delta L \left(\frac{e^{-j\beta r}}{r}\right) \quad \hat{z}$$

b) For short dipole antenna, **Find;**
1. The electric field component E_θ
2. The average radiated power $\bar{P}_{av}$
3. The total radiated power W_{rad}
4. Antenna directivity
5. Antenna effective length
6. **Plot** the **E-plane** and the **H-plane** patterns if the dipole antenna is oriented in **Z-direction**.

Question (3) [17 Marks]

a) If the general form of the magnitude of the electric field component of the long dipole is given by

$$|E_\theta| = 60\,\frac{I_m}{r}\left[\frac{\cos\left(\frac{\beta L}{2}\cos\theta\right) - \cos\left(\frac{\beta L}{2}\right)}{\sin\theta}\right]$$

For $\lambda/4$ monopole antenna find:

1. The average radiated power $\bar{P}_{av}$
2. The total radiated power W_{rad}
3. Directivity D
4. Effective area.
5. Plot the E-plane and H-plane patterns of the $\lambda/4$ monopole antenna.

Electronics and Electrical Comm. Dept.
Total Marks: 85 Marks

Course Title: **Electromagnetic Waves (2)**	Course Code: EEC 3214	Year: 3rd
Date: Sept., 22-6-2017	Allowed Time: 3 Hours	No. of Pages: (2)

Question (4) [17 marks]

(a)For travelling wave antenna (TWA):

1. **Write down** the equation of the electric field component $|E_\theta|$.
2. **Derive** an expression for locations nulls and peaks.
3. State the **advantages** and **disadvantages** of the TWA antenna.

(b) For a TWA of length $L = 5\lambda$

1. **Determine** the location of nulls.
2. **Determine** the location of peaks.
3. **Plot** the antenna radiation pattern.
4. **Design** its corresponding rhombic antenna to cancel the two main lobes problem of the TWA.

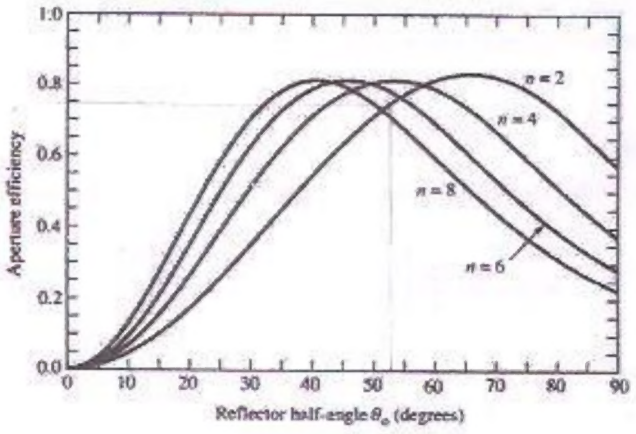
Question (5) [17 marks]

(a) For parabolic antenna derive the relationship between the parabolic antenna parameters (F, d, θ)

(b) **State** the advantages of the parabolic reflector antenna.

(c) A parabolic reflector antenna with $F/d = 0.5$ has a prime-focus feed with a gain function $G(\theta) = G_0 \cos^2(\theta)$.

1. Evaluate G_0 of the feeder
2. The apex angle
3. Find the antenna illumination efficiency.
4. Find the diameter of the reflector in order to obtain an antenna gain of 30dB at 10GHz.



Course Coordinator: *Dr. Ezz Hussein*